CLAIMS

What is claimed is:

1. An architectural arrangement for launching an optical system signal into an optical transport network, the optical system signal being constituted in a layered membership relationship that defines at least two optical layers, comprising:

an optical transport line residing in the optical transport network and operable to carry the optical system signal therein;

a multiplexing component connected to the optical transport line, the multiplexing component operable to receive a plurality of optical data signals therein, combine the plurality of optical data signals to form the optical system signal, and launch the optical system signal into the optical transport line; and

a plurality of signal impairment compensation mechanisms associated with the multiplexing component, the plurality of signal impairment compensation mechanisms operable across each of the optical layers of the optical system signal to perform a signal impairment compensation operation on optical signals therein.

2. The architectural arrangement of Claim 1 wherein the signal impairment compensation operation is selected from the group comprising fixed gain flattening, dynamic gain flattening, optical transient suppression, dispersion compensation and polarization mode dispersion.

3. The architectural arrangement of Claim 1 wherein the multiplexing component further comprises a set of multiplexers operable to receive the plurality of optical data signals and combine the plurality of optical data signals to form a plurality of intermediate optical signals, and a system level multiplexer operable to receive the plurality of intermediate optical signals and combine the plurality of intermediate optical signals to form the optical system signal.

4. The architectural arrangement of Claim 3 wherein at least one signal impairment compensation mechanism is positioned at one or more inputs associated with the set of multiplexers, at one or more inputs to the system level multiplexer, and at an output of the system level multiplexer.

5. A method for transporting optical signals in an optical transport network, comprising:

receiving a plurality of optical data signals;

performing signal impairment compensation on each of the plurality of optical data signals;

selectively combining the plurality of optical data signals to form a plurality of intermediate optical signals;

performing signal impairment compensation on the plurality of intermediate optical signals;

combining the plurality of intermediate optical signals to form an optical system signal; and

launching the optical system signal into the optical transport network.

6. The method of Claim 5 further comprising the steps of:

separating the optical system signal into the plurality of intermediate optical signals at a network switching site associated with the optical transport network, the network switching site interconnecting a plurality of optical transport lines; and

routing at least one of the plurality of intermediate optical signals to one of the plurality of optical transport lines.

7. The method of Claim 6 wherein the step of routing at least one of the plurality of intermediate optical signals further comprises using an optical switch residing at the network switching site.

8. The method of Claim 6 wherein the step of routing at least one of the plurality of intermediate optical signals further comprises manually routing the at least one intermediate optical signal without the use of a switch to a multiplexer residing at the network switching site.

9. The method of Claim 6 further comprising the steps of:

separating remaining intermediate optical signals into a plurality of remaining optical data signals;

routing the plurality of remaining optical data signals to a plurality of optical switches residing at the network switching site.

10. The method of Claim 5 wherein the step of performing signal impairment compensation further comprises at least one of fixed gain flattening, dynamic gain flattening, optical transient suppression, dispersion compensation, and polarization mode dispersion.

11. The method of Claim 5 wherein the step of launching the optical system signal further comprises performing signal impairment compensation on the optical system signal.

12. A layered network architecture for use in an optical transport network, comprising:

a first optical transport line operable to carry an optical system signal therein, the optical system signal being constituted in a layered membership relationship from a plurality of optical data signals;

a second optical transport line operable to carry the optical system signal therein;

a third optical transport line operable to carry the optical system signal therein; and

a network switching site interconnecting the first optical transport line, the second optical transport line and the third optical transport line, where the network switching site includes

a demultiplexing component connected to the first optical transport line, the demultiplexing component operable to receive the optical system signal and to separate the optical system signal into a plurality of optical band signals; and

an optical switch operable to route at least one of the optical band signals amongst the second and third optical transport lines.

13. The layered network architecture of Claim 12 further comprising a multiplexing component associated with at least one of the second optical transport line and the third optical transport line, where at least one of the plurality of optical band signals is manually routed without the use of a switch from the demultiplexing component to the multiplexing component.

14. The layered network architecture of Claim 12 further comprising

a sub-band level demultiplexing component connected to the demultiplexing component, the sub-band level demultiplexing component operable to receive the plurality of optical band signals and to separate the optical band signals into a plurality of optical sub-band signals; and

a sub-band level optical switch operable to route at least one of the optical sub-band signals amongst the second and third optical transport lines.

15. The layered network architecture of Claim 14 further comprising a sub-band level multiplexing component associated with at least one of the second optical transport line and the third optical transport line, where at least one of the plurality of optical sub-band signals is manually routed without the use of a switch from the sub-band level demultiplexing component to the sub-band level multiplexing component.

16. The layered network architecture of Claim 14 further comprising

a wavelength level demultiplexing component connected to the sub-band level demultiplexing component, the wavelength level demultiplexing component operable to receive the plurality of optical sub-band signals and to separate the optical sub-band signals into a plurality of optical wavelength signals; and

a wavelength level optical switch operable to route at least one of the optical wavelength signals amongst the second and third optical transport lines.

17. An architectural arrangement that enables routing of an optical system signal at different optical layers of an optical transport network, the optical system signal being constituted in a layered membership relationship that defines at least two optical layers, comprising:

at least two optical transport lines residing in the optical transport network;

a network switching site interconnecting the optical transport lines, the network switching site having at least one network switch and operable to route optical signals amongst the optical transport lines; and

a plurality of signal impairment compensation mechanisms distributed across each of the optical layers of the optical system signal at locations other than at the network switch, and operable across each of the optical layers of the optical system signal to perform a signal impairment compensation operation on optical signals therein.

18. The architectural arrangement of Claim 17 wherein the signal impairment compensation operation is at least one of fixed gain flattening, dynamic gain flattening, optical transient suppression, dispersion compensation and polarization mode dispersion.

19. A method for routing optical signals in an optical transport network, comprising:

receiving an optical system signal at a network switching site residing in the optical transport network, the optical system signal having a plurality of optical sub-band signals embodied therein;

separating the optical system signal into the plurality of optical sub-band signals embodied therein; and

routing at least one of the plurality of optical sub-band signals to a first optical transport line terminating at the network switching site, such that the at least one optical sub-band signal does not enter an electrical domain.

20. The method of Claim 19 further comprising the step of routing a second optical sub-band signal of the plurality of optical sub-band signals to a second optical transport line terminating at the network switching site, such that the second optical sub-band signal does not enter an electrical domain.

21. The method of Claim 19 further comprising the step of terminating a second optical sub-band signal of the plurality of optical sub-band signals at the network switching site.

22. The method of Claim 19 the step of separating the optical system signal into the plurality of optical sub-band signals further comprises separating the optical system signal into a plurality of optical band signals and separating the plurality of optical band signals into the plurality of optical sub-band signals.

23. A network switching node residing in an optical transport network, comprising:

a first termination point operable to receive a first optical system signal, the first optical system signal having a plurality of optical sub-band signals embodied therein;

a demultiplexing component connected to the first termination point and operable separate the first optical system signal into the plurality of optical sub-band signals embodied therein; and

a multiplexing component operable to receive at least one of the plurality of optical sub-band signals from the demultiplexing component, whereby the at least one optical sub-band signal does not enter the electrical domain in transit from the demultiplexing component to the multiplexing component.

24. The network switching node of Claim 23 further comprising a second optical termination point connected to the multiplexing component and operable to transmit a second optical system signal over the optical transport network, the second optical system signal having the at least one optical sub-band signal embodied therein.

25. The network switching node of Claim 23 further comprising a second multiplexing component operable to receive a second optical sub-band signal from the demultiplexing component, whereby the second optical sub-band signal does not enter the electrical domain in transit from the demultiplexing component to the second multiplexing component; and a third optical termination point connected to the second multiplexing component and operable to transmit a third optical system signal over the optical transport network, the third optical system signal having at least the second optical sub-band signal embodied therein.

26. The network switching node of Claim 23 wherein the demultiplexing component further comprises a system level demultiplexer operable to receive the first optical system signal and separate the first optical system signal into a plurality of optical band signals, and a set of multiplexers operable to receive the plurality of optical band signals and separate the plurality of optical band signals into the plurality of optical sub-band signals.